

AVIATION

JANUARY 8, 1923

Issued Weekly

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U. S. Navy torpedo plane dropping a torpedo

Official Photo U. S. Navy

VOLUME
XIV

Number
2

SPECIAL FEATURES

FOKKER AMPHIBIAN FLYING BOAT
THE WEATHER BUREAU AND AVIATION
ANNUAL REPORT ON THE ARMY AIR SERVICE
SUCCESSFUL DESIGN OF LIGHT WEIGHT METAL WINGS

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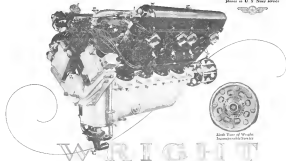
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WRIGHT

JANUARY 8, 1923

AVIATION

VOL. XIV, NO. 2

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No. 2

An Impassioned F.A.I. Decision

IN aeronautical events such as competitions, races, etc. it has happened more than once that owing to external circumstances a mistaken error which was not provided for in the F.A.I. rules. An already famous case of this kind is affected by the long-drawn-out controversy between the Aero Club of France and Italy as to who should be declared the winner of the 1931 Michelin Trophy, which has now definitely been settled by the F.A.I. in favor of Italy.

The controversy arose from the following: The rules for the 1931 Michelin Trophy provided that a circuit of 3800 kilometers with fifteen obligatory landings and returns to the starting place should be covered in the least elapsed time. Pierre, the French pilot, covered the circuit as prescribed in 37 hr. 13 min. Somewhat later Captain Morinetti covered an equivalent circuit in only 35 hr. 45 min., but failed to land at his starting place because the cockpit official expelled him from the ground to land at a nearby field. The official decided upon this measure for reasons of safety, for the starting airfield was in the mountains here flooded by snow. The question arose then whether the F.A.I. would officially let the pilot in after the racing rules in the interest of safety, and whether such an alteration of the rules did not substantially annul the performance.

The French and Italian Aero Clubs took opposite views on the subject, and after an arduous colloquy had failed to solve the question, it remained for the F.A.I., as the supreme sporting authority, to decide the matter. This the F.A.I. did at its recent conference in Rome, where after an involved discussion in which the Italian viewpoint prevailed, it was voted that cockpit officials have the right to prevent a landing prohibited in the racing rules if a contest of their doing is justified. As a result Captain Morinetti was declared winner of the 1931 Michelin Trophy.

The decision of the F.A.I. was rendered at by a unanimous majority vote to show that such was the preponderant opinion of the clubs represented. The motion with respect to the powers of cockpit officials was passed with a two-thirds vote (excluding the American representative), the motion as to the validity of the performance in such case received 25 yes, 6 no, and 3 abstentions. The American representative voted in the affirmative.

We cannot but help feeling that this decision constitutes a dangerous precedent. If the application of racing rules is left to the judgment of the cockpit officials, and the pilot happens not to arrive at the start, because of, say, an emergency, a totally unqualified landings to those contestants who come to the performance under the conditions specified in the rules. However appetizing the case of Captain Morinetti may appear in view of the fact that he made a very fine performance under extremely adverse weather conditions, it seems to us that contest rules are made for one purpose

only: to be strictly observed. It is only thus that performance can be compared on the basis of a common figure of merit. Any other procedure falsifies the elements existing in the situation.

The decision of the F.A.I. is the more regrettable as the wording of the motion relating to the powers of cockpit officials is extremely ambiguous in the French (official) text, and so it is apt to lead to varied and contradictory interpretations. It seems desirable that the National Aeronautics Association take up this matter without delay in order that it may make suitable suggestions to clarify the text at the next conference of the F.A.I.

Air Service and Air Force

GENERAL PATRICK in his annual report on the Army Air Service makes a clear distinction between "air service" and "air force". These two terms have been loosely used for some time, which often has served to bring the terms. The debate involving the Chief of Air Service has given these two terms in definition to be followed.

The report says in this respect: "A study of the tactical and operational employment of aviation disclosed two distinct classifications of military air power—'air service' and 'air force'." The air 'service' of any Army is made up of its observation units, the functions of which are to carry on visual and photographic reconnaissance, to locate enemy targets, to adjust artillery fire, and to carry on contact patrol and other missions with the Infantry. Observation is never offensive and suggests itself only as a means of self defense when attacked by the hostile aircraft.

"Air force" is made up of pursuit, bombardment, and attack aviation and is partly offensive in each of these areas. Pursuit aviation seeks to destroy enemy aircraft of all types, protect friendly observation, bombardment, and attack airplanes from hostile aircraft, and to assist in attacking ground troops and other objectives in the theater of operations. The mission of bombardment is to destroy military objectives, both in the theater of operations and in the enemy's zone of interest. Attack aviation is designed solely for the purpose of harassing enemy ground troops from a low altitude by means of machine guns and fragmentation bombs, and such airplanes are heavily armored as a defense against machine-gun and automatic fire from the ground. Neither attack nor bombardment seek combat in the air, and engage with hostile aircraft only as a defensive measure.

"In a properly balanced air service 25 per cent of the total strength should be made up of observation units and the remaining 75 per cent devoted to 'air force' or combat aviation."

To the public, the term "air service" has indicated an auxiliary arm of the other military forces. "Air force" can now be read with definiteness and a clear idea of its meaning.

Successful Design of Light Weight Metal Wings

Metal Wing Frames Built for Navy H53 Flying Boat Give Excellent Results in Tests at Naval Factory

In Feb., 1928 the United States Navy invited bids for designing two sets of experimental all metal wing frames for an H53 flying boat, and in May of the same year awarded a contract to Charles Wood Hill, Inc., New York, to design and furnish these. Three generally similar designs were submitted with bids, one involving the use of duralumin throughout with steel for form and the others based upon the use of steel tubing for spars and struts, with steel wires and duralumin ribs and skins. The Navy selected the design involving the use of duralumin throughout, but after waiting a year for the delivery of the tubing required for very construction, steel tubing was substituted therefor, and the first wing set completed and shipped Jan. 31, 1929. The second set was completed April 26, 1929.

The guaranteed weight of the complete wing frames was 875 lb plus a manufacturing allowance of 20 per cent. The weight of the wings as shipped was 922 lb, including non-weigh plans and thin wires of 5 lb, which were not originally included. The weight increase within the guarantee was due mainly to refinement of the spar joints, refinement of the strut fittings, and by use of thinner sheet for the nose stiffener, all of which changes were justified by detail tests.

Load Tests

The wings as shipped to the Naval Aircraft Factory, Navy Yard, Philadelphia, were first set up on an H53 hull and proved to be free of any errors in dimensions, they were next set up on a test rig and sand loaded pursuant to Navy Technical Note 167 on the uniform distribution along the span, the forward 50 per cent of the chord uniformly loaded with 30 per cent of the weight, the after 50 per cent of the chord with 30 per cent of the weight; the ribs of soft loads for upper and lower wings being 11 lb 9. The average chord was reduced at 15 deg to the longitudinal, leading edge uppermost.

Loads were applied to wings up to the H53 load, and thereafter at one-half units to a factor of six. Bending for deflection, both vertical and horizontal, were taken at all panel points, and at the main sparweb between panels. Bussoneometer readings on lift, fuselage and external bracing wires were also made.

The deflections were measured and substantially uniform throughout the test. Under maximum load the average vertical deflection of the upper front spar at most section left wing was 7/16 in.; the corresponding point on the rear spar deflected 3/16 in., on the element near the average deflection due to drift was 5/16 in.

Upon removal of the main load fuselage no measurable permanent set was found, nor were any cracks of the wing structure noticed or detected by the loading.

Under a separate contract two steel based set of metal wings have been conditioned and accepted for flying service, a very noticeable performance when it is considered that the weight thereof was only 50 per cent of that of their duralumin counterparts.

Test results at Philadelphia Navy Yard showed a lift speed of 90 mph, around 55 mph for the wooden wings; climb to 1000 ft. before the clock dropped below 300 ft. per min; and climb to 7100 ft. in 30 min.

Principal of Design

The reasons for this acceptable performance do not lie in a mere choice of material, but in a thorough and complete analysis of the actual stresses due to loading, including all secondary effects, and in the correct proportioning of the parts thereof.

In the order of their relative importance these causes may be stated as viz:

(A) The balancing of one secondary stress against

another in such manner as to cancel both, or to cancel one and to uniformly reduce the other of them wherever practicable. The introduction of secondary stresses to relieve the free edges of subsequent sections. Whenever secondary stresses could be utilized to advantage, the character of them by use of concentric joints or otherwise.

(B) The use of a strictly uniform factor of safety throughout, having due regard for the true stress conditions to which any part might be subject in any condition of flight or landing. So detail the small or too inconspicuous to negative full consideration.

(C) The use of stress sections of 140 per cent efficiency throughout, save only where the loads of interest required do not permit of such sections, and for these the use of the most efficient section available.

A few examples of these principles of design are shown in the accompanying photographs:

Fig. 1 shows one of the lower aircraft wing panels, originally assembled a similar general arrangement pertains to all panels. The spars are built up of six mild steel tubes for chords with a lattice web system also of steel tubing. The wing wires are steel as made by the Stevens Machine Co. All other parts are duralumin, the drag struts being 1/4 in. or 1/2 in. in outside diameter and varying in wall thickness to correspond in the loads sustained.

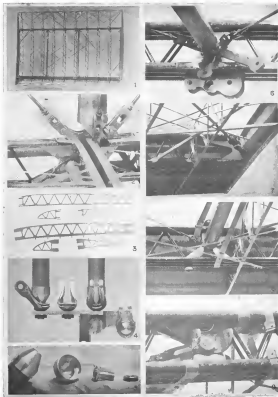
Ribs are punched and pressed from duralumin sheet, for convenience in assembly having been made in these sections, they are braced outward by beams of duralumin sheet 1/4 in. by 6/16 in. in cross section. The leading and trailing edges on also the nose stiffener are drawn to special forms from sheet.

Wing Panel Connections

In the connection of one wing panel to the next it has been customary to use a horizontal pin passing through the center of gravity of the spar section and so resulting in a very long pin passing through the panel webs. In these wings this pin is horizontal, but is so arranged to the gravity axis of the spar that the pin is at its center of gravity by the end thrust stresses along the spar, results in the same bending moment of the panel joints as would have occurred if no joint were present. This has the effect of reducing the support stresses and increasing the center moment in adjacent panels, (see Fig. 2). Substantial increase in the ratio of weight carried to weight of structure results.

Trans members such as spars, being subject both to end load and to bending, are necessarily deflected thereby. If severely straight between the panel points the bending moment due to strains when in addition to end stresses with the bending due to beam action, it is found that becomes a large proportion of the total. In those spars a secondary curvature, as member, contrary in sense to that produced by the beam loading, is used, its amount being such that under maximum stress conditions the member is straight. This, with proper proportions in detail, practically eliminates the 1/2 factor for column action, in the place of spar webs, and results in marked weight saving.

Another method of obtaining a corresponding result by a stiff or bending of the gravity axis of the member instead of curving the member as a whole is shown in the photograph Fig. 3, and other pictures of rib details, by reducing the width of the sheet near the ends as compared to the width at the middle of the web members, the usual tendency of angle sections is to fail either by an untoward opening of the angle legs or by a untoward bending of the angle as a whole, as is counteracted and the free edge of the section relieved of bending stress. Sections so proportioned usually fail by bending instead of bending, and at a much lighter average web stress.



The Weather Bureau and Aviation

Annual Report Details Forecast Work in Aid
Of Aviation and Aeronautical Investigations

The annual report of C. F. Marvin, Chief of the Weather Bureau, contains the following information in forecast work in aid of aviation and aeronautical investigations.

Forecast work in aid of aviation.—The activities in the aid of aviation were intensively increased during the year. Daily forecasts were issued regularly and furnished to Army, Navy, and Post Office officials and to the flying public. In addition, arrangements were made during the year for broadcasting appropriate reports for all the states, except two, from coastal radio stations.

Separate and more detailed forecasts were begun in January, 1922, at the request of the Air Service of the Army for the three air routes from Washington to Norfolk, Va., to Long Island, N. Y., and to Dayton, Ohio. They are issued twice daily and contain references as to weather conditions to be encountered from the surface up to 10,000 ft. These forecasts also are published in convenient form in Washington and at Dayton. The requests for special forecasts and weather information from individual stations before beginning flights have been numerous. This latter information for the most part is supplied by the forecasters by telephone directly to the fliers.

Cooperation with Air Service

Important and extensive cooperation arrangements between the Air Service and the Weather Bureau were established during the year for the purpose of bringing the wisdom of the former service and Weather Bureau officials in the field into closer contact in the real time forecasts, warnings, and weather information may be made of the greatest possible value to the flying public. This cooperation was effected by Air Service officers to the field stations of the Weather Bureau for the purpose of personal acquaintance, the discussion of weather conditions peculiar to the various sections of the country over which flights are made, the securing of knowledge of the facilities at each station, for the furnishing of forecasts and information desired by aviators, and the performing of details for the issuance of such information promptly and wherever required.

The Weather Bureau collects at its field stations intensively observations of weather from all parts of the country at 8 a. m. and 4 p. m. and transmits them by radio to the Air Service field office at the nearest Weather Bureau station by telephone every morning and evening when flying operations are being carried out. For the purpose of obtaining the weather forecasts and reports, fliers then come from their stations to the nearest Weather Bureau station, or they are telephoned to telegraph or telephone any Weather Bureau station at any time for information as to prevailing and predicted weather conditions in a particular section and to receive a personal reply. This feature of the service is designed to enable fliers who for any reason are forced to land at other than regular flying fields to secure all possible information which will enable them to avoid danger in returning to their home stations or in reaching their destinations.

Knowledge of the science of meteorology is an important adjunct to expert flying and a part of the cooperation between the two services includes the delivery of courses of instruction in the science of meteorology to Air Service aviators on the general nature of the weather service, the climatology of various sections of the country, air currents, the physics of the clouds, and the use of the various instruments used in aviation. Already a number of these lectures have been delivered and plans are being developed for a national extension of this work.

Arrangements concerning the details of the cooperation were issued to all field stations of the two services, in which the Chief of the Air Service explained that the matter is "of most vital importance at the present time in connection with aces-

country flying and it is desired that every effort be made to carry out the provisions in outline.

A similar cooperation exists with the aeronautical section of the Navy Department. Forecasts and weather reports are furnished with all possible completeness and dispatch to naval bases at which the service is carried out. A representative of that service is given desk space and facilities in the forecast room of the Weather Bureau at Washington, where he prepares and makes a regular trip to the forecast room of the district and the Weather Bureau at the local headquarters of the Weather Bureau. These official forecasts and weather reports are telephoned by air directly from the Weather Bureau station to the naval base. In this manner the information and advice are furnished with the least possible delay and with efficient results.

Service was rendered for the number of special airplanes flights during the year by furnishing detailed forecasts and extra observations at frequent intervals along the route to be followed. One instance of the kind was the journey of a two-engine biplane, equipped with a special forecast room, from Norfolk, Va., to Pensacola, Fla., by way of the Atlantic coast line to Birmingham, Ala., thence overland across the Florida Peninsula to Cedar Key, from that point to Panama, Fla., and thence to Jacksonville in July, and the service was in the trip was made in accordance with the forecasts and advice furnished by the Weather Bureau. A response was not had with safety on two trips, and it was of the utmost importance, both to the success of the undertaking and to the improvement of the lives of the aviators, that no unfavorable weather conditions be encountered, especially for the long overland trip from Pensacola to Jacksonville. The trip was safely completed without a serious mishap and the commander of the squadron in acknowledgment, the courtesies rendered by the Commander of the Weather Bureau at Washington.

The commander of an expedition desires to express his appreciation of the excellent cooperation of the Weather Bureau, both of Washington and Jacksonville, in furnishing weather forecasts to the air commander of the United States Fish Commission's cruise Florida. The safety of the passage successfully was made more certain thereby, so on the receipt of advance weather reports the commander of the expedition arrived two days earlier than the forecast had indicated and was enabled to make the trip.

Aeronautical Investigations

Field stations.—Observations with balloons were made regularly at Boston Army, Glendale, Dayton, St. Louis, New York, N. J., and New Orleans, La., and at other points. At each of these stations, in addition to the regular observations, special observations were made, whenever possible, and, in addition, when conditions are favorable, continuous series of flights are made for periods of 24 to 36 hr. Records of air pressure, temperature, humidity, and other data are taken.

Pilot-balloon stations.—Observations by means of pilot balloons were made at the six air stations, above listed, and at Washington, V. I., Denver, Colorado, Houston, N. Y., Key West, Fla., Long Beach, Calif., Madison, Wis., San Francisco, Calif., San Juan, P. R., and Washington, D. C. The observations are made twice daily at the six air stations and at Key West, Fla., and at Washington, D. C., and once each day at the other stations, and the associated wind conditions at various heights are interpreted to distant flying centers at Washington, D. C., Chicago, Ill., and San Francisco, Calif., where they figure in the bulletin "The Weather Service Bulletin" issued to the military, naval and postal aviation services.

Special observations have been made, when requested, for use in connection with long-distance flights, from balloon stations.

Observations with two balloons have been continued, whenever opportunity afforded, in order to check the accuracy of the formula for rate of ascent of balloons and the behavior

of the balloons themselves at high altitudes. These observations have shown that the standard rate of ascent formulae given extremely reliable results, and that the behavior of balloons is very much the same in the atmosphere. Even then the error is extremely small in the lower layers.

Cooperation.—Extensive cooperation with the Army and Navy meteorological services has been continued throughout the year. Each of these services maintains a number of pilot balloon stations, whose primary purpose is to furnish data of standards used in the development of the Weather Bureau. In addition to the stations in the United States proper, the Navy maintains one at Santa Domingo, Dominican Republic, and one at Cape Sable, Coast Line, where it cooperates with those of the Weather Bureau at San Juan, P. R., and Key West, Fla., through information of value in connection with the development and movement of hurricanes. A much larger number of stations is necessary, however, to make this service as efficient as it should be.

In the autumn of 1921, at the request of the Director of the Brazilian meteorological service and in cooperation with a representative of that service, long-range stations in Washington, plans for the organization of an aerological service in Brazil, patterned after that in the United States, were outlined and submitted. The Brazilian service reports that the plan is being considered and in this country it is being studied and adopted, and two trained observers of the Weather Bureau were released, in order that they might be instructed by the Brazilian Government, to get the service properly inaugurated in that country.

Control office.—All observations made at land and balloon stations, by the Army and Navy as well as by the Weather Bureau, are forwarded to the control office of the Weather Bureau for final reduction and study. Data based upon these observations are furnished in answer to numerous requests sent out by the various government departments, and from commercial aviation concerns as well. In many cases reports of special observations and forecasts were issued in answer to these requests.

American Legion Aeronautic Committee

The American Legion is taking an active interest in aviation through a Committee on Aeronautics headed by Maj. Reed G. Lindsay, which has just been organized. The committee is made up of flying men who are directly interested with the activity of the development of aviation both military and commercial. It is currently endeavoring to formulate an efficient aviation policy for the Legion and it will vigorously attempt to put the program into effect after it has been formulated.

The Committee is very anxious to receive fundamental suggestions to make that it may and will be a supporting element. The question now before the Legion is what should be done next?

Committee suggestions are printed and should be addressed to Reed G. Lindsay, 327 West Madison Street, Chicago. At the Annual Convention of the American Legion held in New Orleans, Oct. 18, 1921, the following resolution was adopted:

"Whereas, the American Legion is an American organization pledged to Americanism and to the development and support of all ideas and movements for the future peace, prosperity and welfare of our country;

Whereas, it has in its local Posts and County, State and National organizations, a powerful machinery, which can be put into operation with successful effect, in support of the advancement of vital issues of the United States;

"Whereas, Aeronautics is a subject of vital interest to the United States, for the purpose of National defense and the development and commercial aviation in order that our country may keep abreast of the advance made by other nations in this direction, be it

Resolved, that the American Legion shall be a co-operative with the U. S. Army Air Service and other nationally recognized institutions and organizations devoted to the advancement of aviation, and shall encourage the development of national policy, sound and state representations and national agencies, to secure the interest of the people in the development of commercial aviation, at such times and places as conditions may require, and shall encourage the development of aviation, and it will vigorously attempt to put the program into effect after it has been formulated.

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Looking to Study European Airways

Greater Learning, the airplane magazine who took the Air Traffic and had last summer issued New York City and Newport by Herald R. Vandenberg, Vincent Astor and others, recently called for Europe.

In connection with projects now being studied for air lines next summer from New York to Newport, Southampton and other nearby ports, Mr. Learning will make an investigation of the transportation and equipment used in several European air lines, and will make a study of the various methods and their latest developments. While in Paris, Mr. Learning will represent the Associated Chamber of Commerce of the United States and Canada, the Chamber of Commerce which is held at the Grand Hotel, and will also be gathered around the airport from all over the world.

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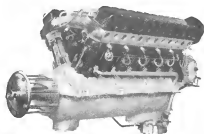
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